OPERATING INSTRUCTIONS

TYPE 1116-A

EMERGENCY POWER SUPPLY

ATR
Type 28U

GENERAL RADIO COMPANY

953-E

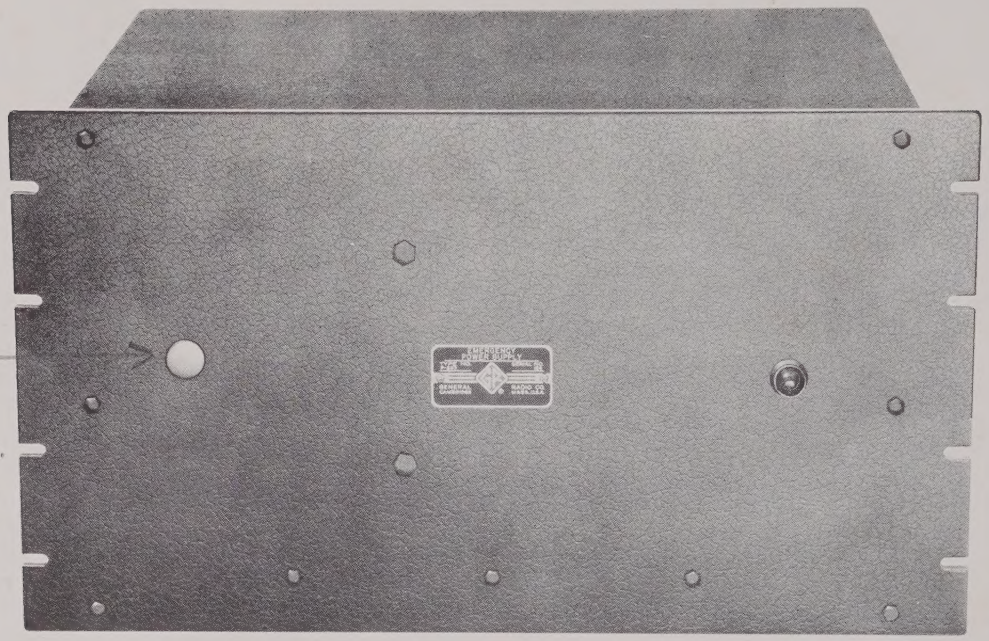


Figure 1. Type 1116-A Emergency Power Supply.

SPECIFICATIONS

Input: 115/230 v, 50-60 cps from power line
28-32 v, 10-7.5 amp from battery (when operating frequency standard)

Output: 115 v, nominal, 60 cps, 180 watts continuous

DC Voltage Input	Typical Battery Current Input	Typical AC Voltage Output	Inverter Switch Position
28	10	116	MAX
30	9	118	HIGH
32	7.5	115	MED

Accessories Supplied: Modification kit for Type 1103-A Syncronometer (Refer to paragraph 1.3.) if needed

Accessories Required: 28-, 30-, or 32-v battery

Dimensions: Length 19 in., height 10½ in., depth behind panel 13 in.

GENERAL RADIO EXPERIMENTER reference: Volume 32 No. 6, November, 1957

TYPE 1116-A
EMERGENCY POWER SUPPLY

1 INTRODUCTION.

1.1 PURPOSE. The Type 1116-A Emergency Power Supply (Figure 1) is a combination inverter and switching device which, when used with a 28-32-volt storage battery, provides continuity of 115-volt ac supply despite interruption of normal power service. Although primarily designed as an emergency supply for the Type 1100-AP Primary Frequency Standard, the Type 1116-A can operate any 115-volt, 60-cps equipment within its continuous power rating of 180 watts.

1.2 DESCRIPTION. The Type 1116-A Emergency Power Supply is housed in a 16½ by 12 by 10½-inch cabinet, with a 19-inch, gray-crackle-finished panel for relay-rack mounting. On the rear of the instrument are three toggle switches, which make or break the battery input, line-voltage input, and 115-volt output connections. Also on the rear are fuse holders that contain the line-input fuses, and connectors for normal line-voltage supply, battery, and device being operated.

1.3 ACCESSORIES. Supplied with the Type 1116-A Emergency Power Supply (when it is to be used with a frequency standard) is a modification kit to provide additional storage for the Type 1103-A Syncronometer. The kit consists of three 5-μf filter capacitors (Part No COL-9) and one 750-ohm, 1-watt resistor (Part No. REW-4C).

2 PRINCIPLES OF OPERATION (See Figure 2).

Upon failure of the 115/230-volt ac line voltage, the relays in the Emergency Power Supply (1) connect the vibrator-type inverter to the battery, and (2) transfer the power input terminals of the frequency standard (or other device) to the inverter output. (The inverter switch should be set in the proper position for the nominal voltage of the battery in use, namely, 28, 30 or 32 volts.) This changeover is accomplished so rapidly that, with a normally-operating frequency standard (modified by the kit supplied), no interruption in operation of the syncronometer occurs.

On resumption of regular line service, the relays (1) disconnect the inverter from the battery, and (2) connect the power input terminals of the frequency standard (or other device) to the normal power supply.

A tapped transformer in the ac line input to the Emergency Power Supply helps maintain reasonably uniform pickup and dropout voltages for operation of the relays. Another transformer permits 115-volt operation of the frequency standard (or other device) with either 115- or 230-volt input. The output of the Emergency Power Supply is always 115 volts.

If the normal power system is at 60 cps, the frequency of the Type 1116-A output is the same during normal and emergency operation. If the power system is at 50 cps, the output of the Type 1116-A is 50 cps during normal

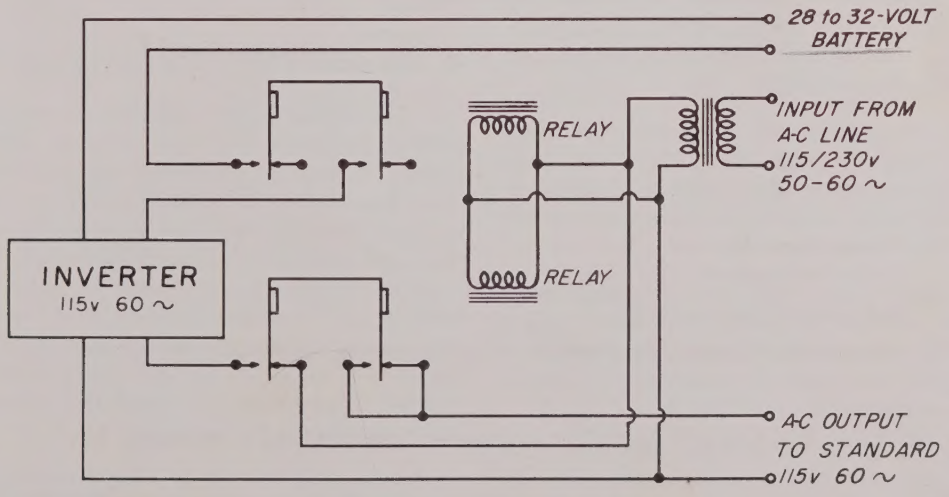


Figure 2. Elementary Schematic Diagram.

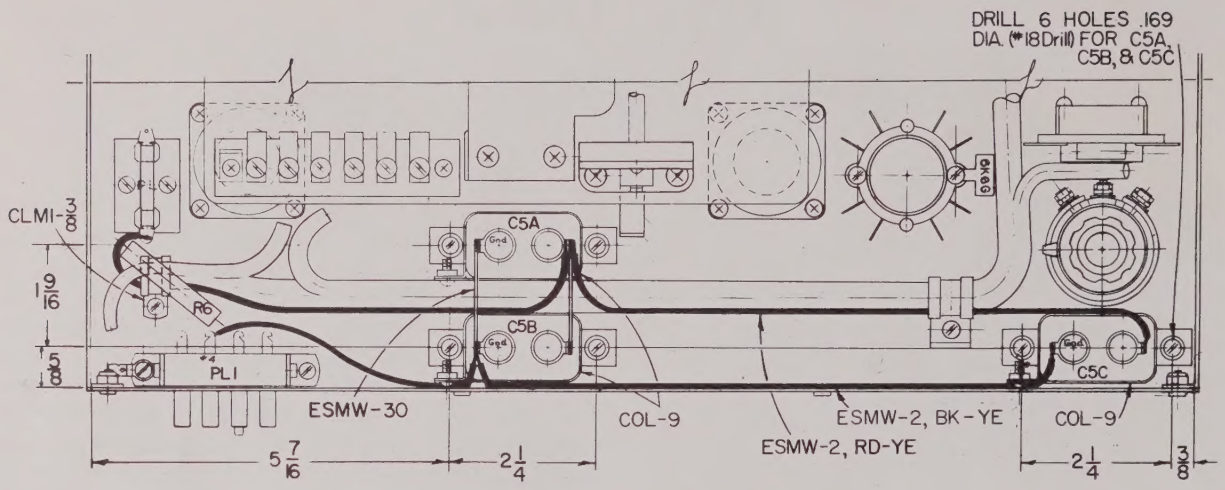


Figure 3. Syncronometer Modification Details.

service and 60 cps during emergency service. This change in supply frequency output will not affect operation of a frequency standard.

The inverter output voltage will vary a few volts as the heater of the frequency standard (around 30 watts) cycles on and off. This variation is perfectly normal, caused by the appreciable internal resistance of the inverter.

3 INSTALLATION. Connect a 28- to 32-volt storage battery of suitable capacity (the Type 1116-A draws about 10-7.5 amp) to the BATTERY connector on the Type 1116-A, observing polarities indicated on the terminals. Connect the normal 115 '230-volt supply line to the 115 '230 V LINE INPUT connector, and connect the frequency standard (or other device) to the 115V AC OUTPUT connector. Turn inverter switch to proper position as given in specifications table.

Make sure that transformer T1 is properly connected for the normal supply voltage. For 105-125-volt input terminal 1 should be connected to terminal 3, and terminal 2 to terminal 4. For 210-250-volt input, connect terminal 2 to terminal 3 (see Figure 4).

If the frequency standard has been operating from a 230-volt source, change the power-transformer connections in the Type 1102-A Multivibrator and Power Supply Unit for 115-volt operation by connecting terminal 1 to terminal 3 and terminal 2 to terminal 4.

Connect the tap of the small relay transformer (T2) to correspond with the average supply voltage as indicated below:

Connect Tap to Terminal	For Average Line Voltage of
2	110
3	115
4	120
5	220
6	230
7	240

If the Type 1116-A is to be used with the Type 1103-A Syncronometer, modify the Syncronometer as described in paragraph 4. (On frequency standards purchased with Emergency Power Supplies, this modification will have been made at the factory.)

When all necessary connections have been made, snap all three toggle switches ON to place the unit in operation.

4 USE WITH TYPE 1103-A SYNCRONOMETER.

4.1 GENERAL. If the synchronous motor of the Type 1103-A Syncronometer is not in good mechanical condition, interruption of service may occur upon changeover from regular to emergency service. Additional filter capacitors for the Syncronometer are supplied with the Type 1116-A Emergency Power Supply to provide an additional safety factor. However, if the 1-kc synchronous motor is in poor condition, even this modification may not be enough to prevent interruption of service. After installation of the additional capacitors as described in paragraph 4.2, check the performance of the motor as described in paragraph 4.3.

A schematic diagram of a Syncronometer modified for use with the Type 1116-A is given in Figure 5.

Mod. made Sept 25/61

4.2 INSTALLATION OF FILTER CAPACITORS IN SYNCRONOMETER.

a. Disconnect the slate (green tracer) wire from the rear of the plate fuse holder (PL, Figure 3), and tape the end of the wire (or cut off at braid).

b. Disconnect the slate (green) wire from terminal 3 of the connector PL1 (Figure 3), and tape the end of the wire.

c. Connect the 750-ohm, 1-watt resistor supplied (R6) between terminal 3 of PL1 and the rear terminal of the fuse holder.

d. Mount the three filter capacitors supplied (C5A, C5B, C5C) on the rear of the chassis base (see Figure 3 for drilling layout), moving the cable to make room, as shown.

e. Connect the three capacitors in parallel (Figure 3).

f. Connect one set of terminals to terminal 4 of PL1.

g. Connect the other set of terminals to the rear terminal of the fuse holder.

4.3 SYNCRONOMETER TEST. To check the operation of the 1-kc synchronous motor, place the frequency standard in normal operation, and, when the second hand of the syncronometer reaches a cardinal point, quickly snap the PLATE switch OFF. The motor should coast for at least eight seconds (on the clock face; longer in actual time). If the motor coasts less than eight seconds it may stop during changeover to emergency service. In such instances, the cause of the abnormally high friction should be determined and the condition corrected.

5 OPERATION CHECK. To check the operation of the Type 1116-A Emergency Power Supply, throw the 115-230-volt LINE INPUT switch to OFF. The frequency standard (or other device) should continue to operate. Return the LINE INPUT switch to ON. Again operation should be continuous.

6 SERVICE AND MAINTENANCE

6.1 GENERAL. For service and warranty information on the inverter unit, refer to the manufacturer's instructions, enclosed with this manual. Refer problems not connected to the inverter unit to the General Radio Company Service Department, which will cooperate as much as possible by furnishing information as well as by supplying any replacement parts needed. When writing to our Service Department, please specify the serial and type numbers of the instrument. Also give a complete report of trouble encountered, and steps taken to eliminate the trouble.

Before returning an instrument or part for repair, please write to our Service Department, requesting a Returned Material Tag, which includes shipping instructions. A purchase order covering repair of material returned should also be forwarded to avoid unnecessary delay.

6.2 REPLACEMENT OF VIBRATOR. To replace the vibrator, first remove the left side panel of the Power Supply by removing six 3/8-in. and three 1/2-in. Phillips-head screws. Then remove the two screws that attach the cover of the inverter unit. (Removal of a front-panel snap button provides access to the front screw.) Remove the old vibrator and plug in the replacement. For data on vibrators, refer to the inverter instructions enclosed. When replacing the inverter cover, make sure that the sponge-rubber pad is on the vibrator side.

Hours Ran 8 Secs.

JAN 15/62. Installation Completed after long delay getting conduit installed. Adjusted vibrator for 115 V output under load & Set on "MEDIUM" position. (In the High position, output is near 150 VAC!) Tap on T_2 put on Term # 3 for 115 V alt operation (line voltage checked).

Test interruption of line voltage did not cause clock stoppage.

30 Amp Fuse Plugs put in Battery line.

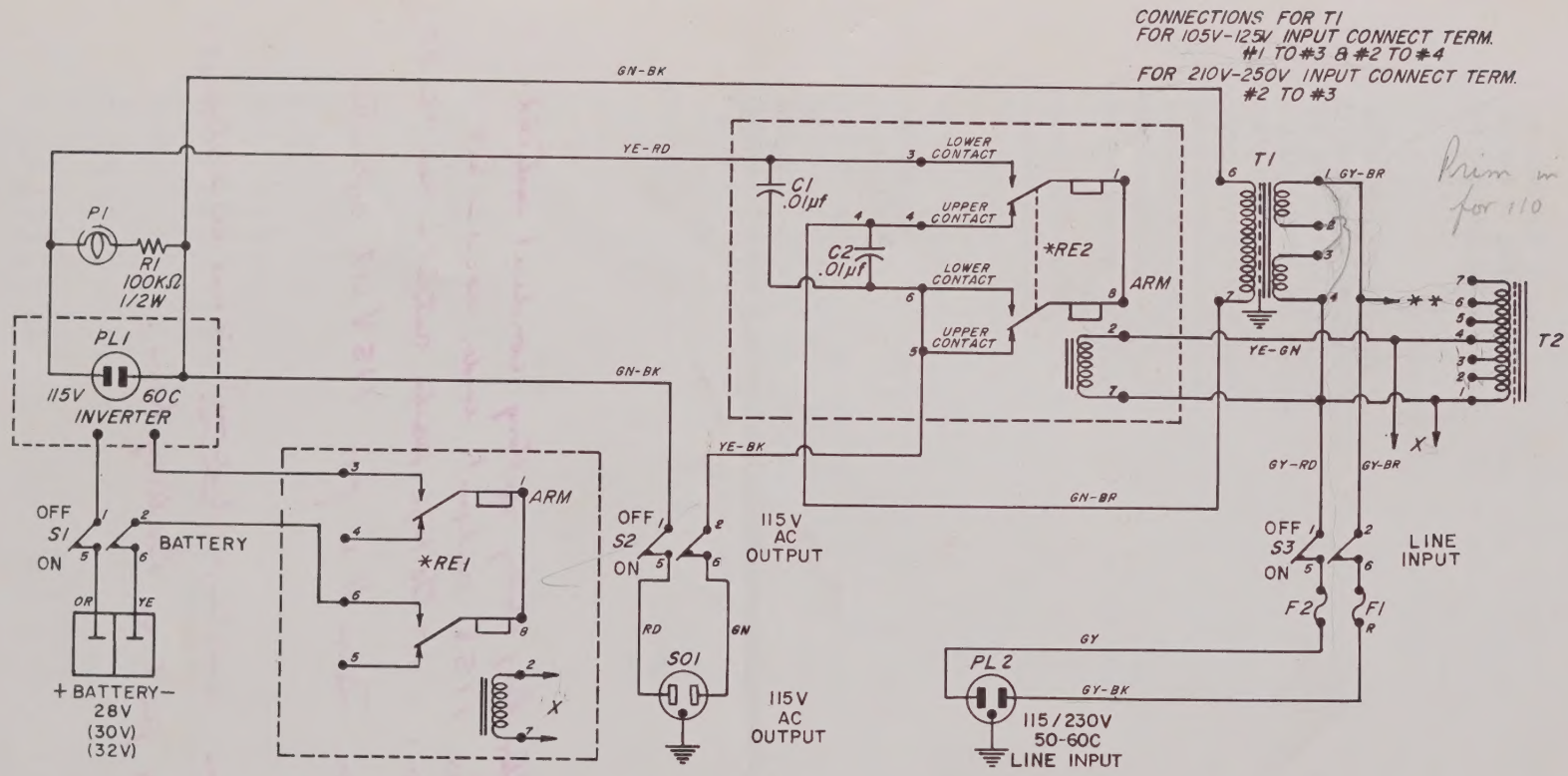


Figure 4. Schematic Diagram, Type 1116-A Emergency Power Supply.

PARTS LIST

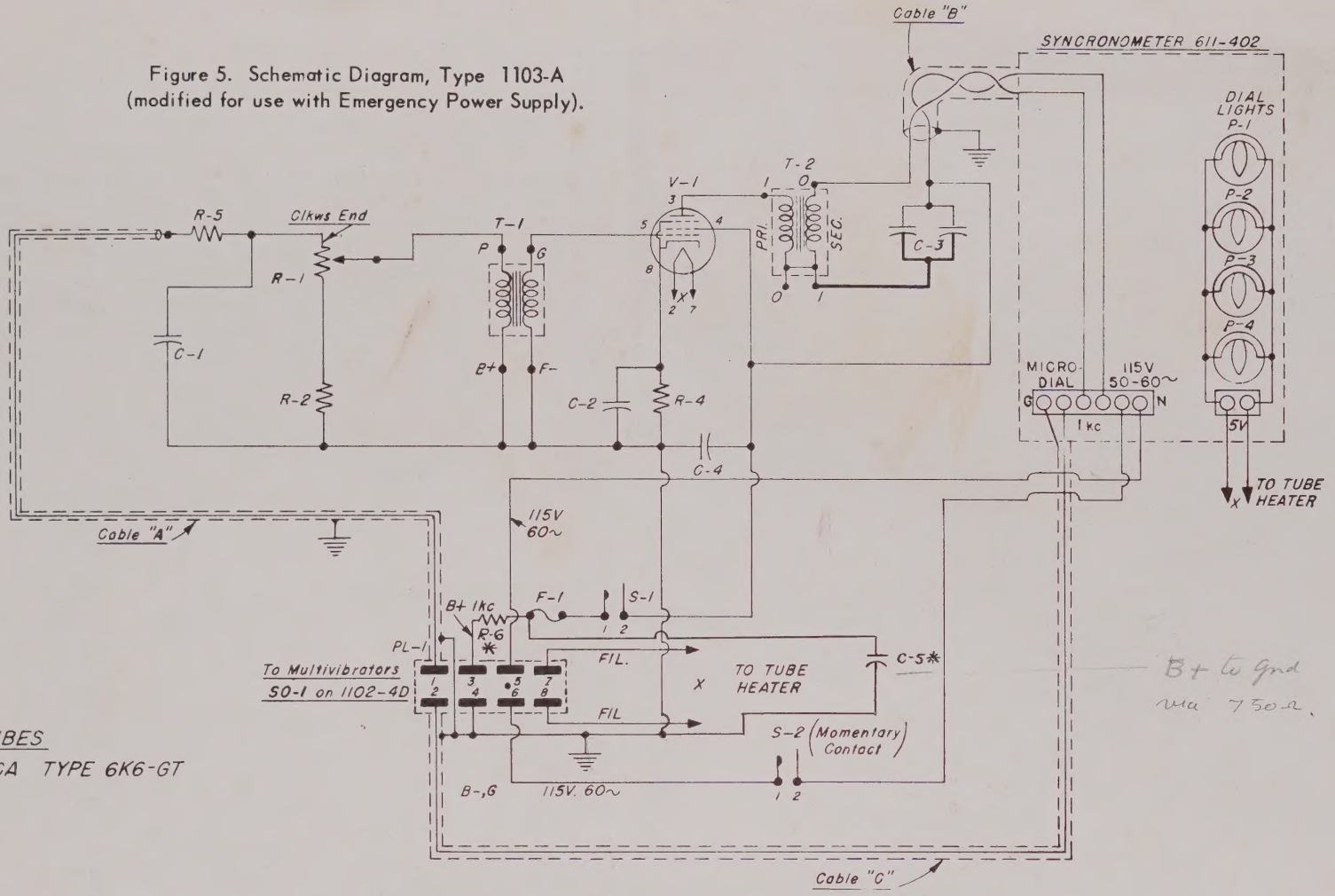
C1	CAPACITOR, Oil-impregnated, 0.01μf ±10%, 600 dcwv	COL-71
C2	CAPACITOR, Oil-impregnated, 0.01μf ±10%, 600 dcwv	COL-71
F1	FUSE, 2 amp Slo-Blo Type 3AG (for 115 v)	FUF-1
F1	FUSE, 1 amp Slo-Blo Type 3AG (for 230 v)	FUF-1
F2	FUSE, 2 amp Slo-Blo Type 3AG (for 115 v)	FUF-1
F2	FUSE, 1 amp Slo-Blo Type 3AG (for 230 v)	FUF-1
P1	PILOT LAMP, Neon, 115 v	NE-51
R1	RESISTOR, Composition, 100 k ±10%, 1/2 w	REC-20BF
REL1	RELAY	P583-42
REL2	RELAY	P583-42

S1	SWITCH, dpst	SWT-1279NP
S2	SWITCH, dpst	SWT-333
S3	SWITCH, dpst	SWT-333
T1	TRANSFORMER	685-414
T2	TRANSFORMER	345-475

NOTE

When ordering replacement components, be sure to include complete description as well as Part Number. (Example: R85, 51 k ±10%, 1/2w, REC-20BF.)

Figure 5. Schematic Diagram, Type 1103-A
(modified for use with Emergency Power Supply).



TUBES

V-1 = RCA TYPE 6K6-GT

PARTS LIST

C1	CAPACITOR, Mica, 0.05μf ±10%, 600 dcwv	COM-50B	R1	RESISTOR, 50k	301-469	S1	SWITCH, spst toggle	SWT-323
C2	CAPACITOR, Oil-impregnated, 2μf ±10%	COL-6	R2	RESISTOR, Composition, 25 k ±10%, 1 w	REC-30BF	S2	SWITCH, spst push-button	SWP-809
C3	CAPACITOR, Mica, 0.0125μf ±10%, 600 dcwv	COM-50B	R4	RESISTOR, Wire-wound, 1 k ±10%, 1 w	REW-4C	T1	TRANSFORMER	346-H
	CAPACITOR, Mica, 0.0125μf ±10%, 600 dcwv	COM-50B	R5	RESISTOR, Composition, 0.1M ±10%, 1 w	REC-30BF	T2	TRANSFORMER	693-30
C4	CAPACITOR, Oil-impregnated, 5μf	COL-5	*R6	RESISTOR, Wire-wound, 750Ω ±10%, 1 w	REW-4C	V1	TUBE	6K6-GT
*C5A	CAPACITOR, Oil-impregnated, 5μf	COL-9	P1	LAMP, 6.3 v, Mazda Type 44	2LAP-939			
*C5B	CAPACITOR, Oil-impregnated, 5μf	COL-9	P2	LAMP, 6.3 v, Mazda Type 44	2LAP-939			
*C5C	CAPACITOR, Oil-impregnated, 5μf	COL-9	P3	LAMP, 6.3 v, Mazda Type 44	2LAP-939			
F1	FUSE, 0.2 amp Slo-Blo Type 3AG	FUF-2	P4	LAMP, 6.3 v, Mazda Type 44	2LAP-939			

*Parts added for use with Type 1116-A

NOTE: When ordering replacement components, be sure to include complete description as well as Part Number. (Example: R9, 3k ±10%, 1w, REC-20BF.)

GENERAL RADIO COMPANY

WEST CONCORD, MASSACHUSETTS

EMerson 9-4400 CLearwater 9-8900

DISTRICT OFFICES

NEW YORK

Broad Ave. at Linden, Ridgefield, N. J.
Telephone N.Y. WOrth 4-2722
N.J. WHitney 3-3140

PHILADELPHIA

1150 York Rd., Abington, Penna.
Telephone HAncock 4-7419

WASHINGTON

8055 13th St., Silver Spring, Md.
Telephone JUniper 5-1088

CHICAGO

6605 West North Ave., Oak Park, Ill.
Telephone VIllage 8-9400

LOS ANGELES

1000 N. Seward St., Los Angeles 38, Calif.
Telephone HOllywood 9-6201

SAN FRANCISCO

1186 Los Altos Ave., Los Altos, Calif.
Telephone WHitecliff 8-8233

CANADA

99 Floral Pkwy., Toronto 15, Ont.
Telephone CHerry 6-2171

REPAIR SERVICES

EAST COAST

General Radio Company
Service Department
22 Baker Ave., W. Concord, Mass.
Telephone EMerson 9-4400

NEW YORK

General Radio Company
Service Department
Broad Ave. at Linden, Ridgefield, N. J.
Telephone N.Y. WOrth 4-2722
N.J. WHitney 3-3140

MIDWEST

General Radio Company
Service Department
6605 West North Ave., Oak Park, Ill.
Telephone VIllage 8-9400

WEST COAST

Western Instrument Co.
826 N. Victory Blvd., Burbank, Calif.
Telephone VIctoria 9-3013

CANADA

Bayly Engineering, Ltd.
First Street, Ajax, Ontario
Telephone Toronto EMpire 2-3741

www.manualsplus.com

1033563

Printed in USA